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ABSTRACT

The 15-year history of the development of library automation is traced, and four major obstacles which had to be overcome are identified: the lack of funds for development, programing, and testing; the need for a common data base; the need for cooperative arrangements among institutions; and the need for widely-available on-line processing. Seven trends of the future are enumerated: minicomputers, turn-key systems, microwave and telecommunications satellites, large random-access computer stores, expanded data bases, cooperation, and national planning. (SK)

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Planning for Library Automation in the United States

by Don S. Culbertson

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Introduction

It is difficult to believe, given the current rapid rate of library automation progress, that substantial work in the field goes back only fifteen years. No other development in librarianship has consumed so much interest, so much manpower and so much money in such a short period of time. But even within this short period trends were indicated by certain developments. The era of punched cards, the introduction of the 1401, the advent of MARC, the availability of Federal and other grants, cooperative arrangements and consortia and most recently the use of on-line processing were some of these trends.

After long development by Quigley, Parker and others, the feasibility of using punched cards and punched paper tape for a broad range of library applications was demonstrated. Libraries did not generally take advantage of this development work until college and city and state business officers acquired punched card equipment for their own financial operations thus making it available to librarians in the same governmental unit.

Wide availability in the business world of the transistorized IBM 1401 computer made it a natural step up for those libraries already using punched card handling equipment. It was versatile, was easy to program, was relatively inexpensive and had a high speed line printer. With over 14,000 of these machines in the market, program support by IBM was outstanding.

There were still obstacles to a general adopting of computerized techniques by library administrators who recognized that costs of personnel were consuming.

an increasingly disproportionate amount of their library budgets.

The first obstacle was lack of funds for system development, programming and testing. These processes are expensive and even many of the largest libraries which might have been expected to use money from their rapidly expanding budgets for such development, chose not to do so. Three organizations, however, did see the need for financial support in developing library computer applications. The Council on Library Resources, Inc. provided seed money for dozens of automation efforts, the National Science Foundation and the U. S. Office of Education also supported many major library automation development programs.

Second was the need for a commonly defined data base. While systems development is expensive, the conversion of bibliographis records to machine readable form is prohibitive in cost unless the cost can be borne within the normal acquisitions -- cataloging budget of a single library or shared among several libraries. Standardization of the elements, fields and tags of the machine readable record also is absolutely essential. The Library of Congress, with the cooperation and advice of librarians throughout the world, developed a standard format for bibliographic records in machine readable form. It was called the MARC (Machine Readable Cataloging) Format. As LC put bibliographic records in machine readable form they distributed them to an eagerly waiting public. This program enabled library automation to take a quantum step forward and it is the foundation of every automated and automating library in the U. S.

Third was the need for cooperative arrangements among institutions in order to spread out the development costs within the consortium. Even if funds are acquired from an outside agency, the costs of managing the data base and the

costs of hardware, i.e. the computer and its peripheral devices, have to be split among several potential users. Many consortial were started, many with the avowed goal of adopting library automation techniques centrally and sharing both the costs and the benefits. The New England Library Information Network (NELINET), Five Associated University Libraries (FAUL) and the Ohio College Library Center (OCLC) are examples of consortia which included automation of library operations as principal goals. There are dozens of other consortia and cooperative arrangements in operation, the latest of which is an amalgam of four large libraries which have been independently developing automation programs: The New York Public Library, Columbia University Libraries, Harvard University Libraries and Yale University Libraries. Although the main purpose of their Research Libraries Group (RLG) is not automation computers will play a major role in their cooperative acquisitions programs and resource sharing.

Fourth, on-line processing has been a reality for several years but the recent availability of large sized disc storage devices at reasonable prices and inexpensive versatile input and output terminals has placed this sophisticated procedure within the reach of librarians. At present Stanford University Library, the University of Chicago Library and the Ohio College Library Center and its 280+ terminals are examples of operational library systems in daily use based upon on-line processing.

These then are some of the milestones which have marked our progress in library automation to the present. What trends herald or progress into the future? Seven of them are enumerated here.

Mini - Computers

The cost of computer hardware has continued to go down through the years.

This trend is especially evident in the so called mini-computer. A result of the development of integrated circuits, the typical mini is the size of an office desk, costs about as much as a new Ferrari automobile and is as powerful as a medium sized computer of ten years ago which filled a large room. In addition, the mini is many times faster in executing its operations and the programming language used is considerably more sophistocated. High speed printers and large disc files can be accomodated. Most internal library procedures can be handled in a computer of this type. Circulation control, acquisitions systems, serials lists and check in routines, reports catalogs, production of catalog cards are within the grasp of relatively small libraries while,with on-line telecommunications facilities, a mini could handle a large university or public library or a system of libraries.

"Turn-Key" Systems

While the hardware problem seems to have been solved for libraries, and in fact there are so many choices of computers, terminals and other devices that intelligent selection is difficult even for an expert, the software or program picture is not as good. Systems development and programming, especially of an entirely new system, is expensive and slow. Many librarians would welcome a complete package; computer, programs, peripherals, forms, instructions. All of the work done except for connecting the machine to a power source and turning it on. Such systems are called "turn-key" systems. One corporation is offering a computer with a light pen unit to read bar coded book labels, special book and card labels and complete programs for a public library loan system. Installation and program maintenance are handled by the company. This organization, Computer Library Information Systems, Inc., also offers programming packages for other library functions using the same venerable PDP-11 computer.

A turn-key system has disadvantages as well as advantages. There is always

the danger that the computer will become obsolete and will no longer be supported by its manufacturer. Inasmuch as the computer expertise resides in the vendor's personnel and not in the library staff, a good and continuing relationship must be assured. The librarian contemplating acquiring a packaged system also must be prepared to accept the package the way it was designed and bend his own operations to fit it rather than expecting a turn-key program be custom modified for a unique situation.

This type of product offering will expand using newer, more sophistocated computers and encompassing more library functions. Competition will bring the price down which may lead to total system leases rather than the present sales arrangements. This would protect the librarian from the risk of machine obsolescence.

Microwave and Telecommunication Sattelites

Present on-line library operations depend upon telephone lines for communication between the remoteterminals and the central computer. The rate of data transfer over telephone lines is relatively slow because the band width is too narrow. It is therefore expensive to send a lot of data over a narrow band width line as both the line and the computer are tied up for a excessive length of time. The usual practice is to conduct the search (or identify the correct bibliographic record) and have the information printed off-line on a high speed line printer and mailed to the searcher (cataloger).

One method of computer communications which would provide suitable band width to accelerate data transfer and allow long lists to be printed by a high speed line printer coupled to the terminal while the terminal is on-line. ismicrowave data transmission. Microwave towers are being

all major cities by several different companies including MCI, Inc., Datran, Inc., and AT&T. The MCI link from Chicago to St. Louis, a distance of 290 miles, has been in operation for over a year. Customers pay for only the time and the portion of the band width they use plus, of course, distance.

The National Aeronautics and Space Administration (NASA) has sponsored several experimental communications sattelites. One or two library tasks have been operated on these devices most notably in Alaska. Most sattelites have been low powered with a narrow band width which required a powerful ground transmitter with a huge antenna. Two new sattelites, ATS-F and ATS-G, the first scheduled for launch during 1974, have high powered, broad band transmitters and carry a 55 foot dish antenna. This will permit small Earth antennas and relatively cheap transmitter-receivers. It must be realized that NASA sattelites are for experimental purposes only, not for long term projects. Commercial sattelites owned by COMSAT Corporation and others are in use but are used as relay points for television networks and to carry telephone messages as a substitute for long distance lines. Library data sent by sattelite would be used like any conventional communications link except that the charges would not vary with the distance.

Large Random Access Computer Stores

Librarians learned early on that the size of a national bibliographic file is very large; too large in fact for the largest computer memory. The average bibliographic record contains about 600 characters (bytes). If a library has ten million volumes, then data storage for this one file alone would be six billion (thousand million) bytes. Until recently no on-line computer storage existed which could hold a file of this size. Now mass memory devices are on the market with capacities adaquate to store the records of a large

library. This makes the true on-line catalog feasible. IBM has announced the 3851 Cartridge Storage with 35 to 472 billion bytes. The Atomic Energy Commission has placed an order for a trillion (million million) byte memory which will be available for library and information retrieval purposes. Other computer storage devices of this size will come on the market in the near future with consequent reduction in cost.

Expanded Data Bases

Better communications media for computer data and larger memories to enable the complete bibliographic records of a library to be stored and used on-line are good omens for the future of library automation. Without vastly expanded data bases, however, most of this new power will remain unused. The number of data bases has sharply expanded in the last three years. Thirty-one on-line data bases are now available but few records predating 1968 are in machine readable form. Most of these data bases are bibliographic descriptions of journal articles, some with abstracts. Index Medicus, Engineering Index and Chemical Abstracts are examples of journal indexes available on magnetic tape. The MARC Service from the Library of Congress has distributed 450,000 records of books representing only about 1/30th of the books in the Library of Congress catalog.

Two trends indicate that data bases will be rapidly expanding for library use in the future and will continue to expand. First, the efforts to standardize the format of the record itself on an international level is well underway. The ease of transfering bibliographic data from one file to another is directly related to the commonality of the data elements and their identification in the record. The International Standard Bibliographic Discription (ISBD) is only one part of a broad effort to establish international standards which

concerns this organization (IFLA), the United Nations, the International Standards Organization and others. Once such agreement is reached, the number of available records will soar. But until then libraries in the U. S. will continue to use the MARC file which is expanding at about 2000 records per week plus those local records to which they mau have access.

The second data base trend is in the maintenance of the data bases by commercial interests. The purchase or leasing of the files, their updating and the provision of the search programs is done by the vendor. The customer (library) purchases one or more terminals and pays for the communications lines, usually dial-up telephone lines. The terminal user then searches the files using the terminal to query and receive response from the computer. System Development Corporation and Lockheed Information Systems are two such vendors. A new data base is added almost every month. New records are added periodically, as LC adds to the MARC file. This service can only expand.

Cooperation

It is not really necessary to point out that cooperative arrangements will continue to grow among libraries. Previously memtioned was the Research Libraries Group which is expected to attract other large research libraries. As inflation continues to reduce the effective size of library budgets and libraries continue to be less able to keep up with the expansion of knowledge, cooperative arrangements to share resources and divide acquisitions responsibilities will be essential if a library expects to continue to serve its clients.

Like the effect of a chemical on an ecosystem, the future effect of broad library cooperation on the whole system of information usage may be largely unknown at this time. For instance, New York publishers have been critical of the formation of the Research Libraries Group (RLG) claiming that cooperative

acquisitions will reduce the number of book purchases and increase violations of the copyright law. RLG spokesmen deny that the effect of cooperation will be severe but state it is the only way large research libraries can survive in these times. The Ohio College Library Center produces over 200,00 cards per week. Previously many of these catalog cards were purchased from the Library of Congress. OCLC is only one agency of several which are producing catalog cards for customers. The result at LC is falling revenues from card sales and the recent loss of 73 positions in the Card Division. In spite of these few negative results, cooperation among libraries will increase.

National Planning

One of the basic problems of library automation in the U. S. has been the lack of planning on a national scale. In the years since it became obvious that libraries, like the telephone company, were going to have to automate to continue to serve their users, librarians have looked to all their national organizations for leadership and failed to receive it. The Library of Congress is not the national library, the American Library Association was fighting for its fiscal life, other agencies were not large enough for the task, others thought it was not their mission.

Finally in 1971, the National Commission on Libraries and Information Science was created. They moved slowly, hearings were held and in October 1973, the National Program for Library and Information Services was presented. A second draft has appeared for comment with the final report due about March 1975. Legislation will hopefully be forthcoming during the 1976 congressional sessions. The National Commission itself has never received full funding authorized in the act which created it. The plan, which will be expensive, has the Federal government funding cooperative programs within and among states. A national network will be used to make the information resources of

federal agencies available directly to the states. Support for computers and telecommunications are part of the plan.

The plan appears feasible and librarians and others are being given (and have had) an opportunity to contribute ideas and make criticisms. If in two or three years the result is funded legislation, a new era in library development in the U. S. will begin.